

PhytoFindTM

in situ Algal Classification

User's Manual



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TURNER DESIGNS
1995 N. 1st Street
San Jose, CA 95112
Phone: (408) 749-0994
FAX: (408) 749-0998

PhytoFind Algal Classification

Contents

1.0	<i>Introduction</i>	4
2.0	<i>Inspection</i>	5
2.1	Instrument Checklist.....	5
2.2	Optional Accessories.....	6
2.3	Identification.....	8
3.0	<i>PhytoFind Windows™ User Interface</i>	9
3.1	Software Installation and PC Requirements.....	9
3.1.1	Minimum PC Requirements.....	9
3.1.2	Software Installation.....	9
3.1.3	Communication and Integration Cable.....	10
3.1.4	PC Software Interface.....	10
3.2	Software Operation.....	12
3.2.1	Main Tab.....	12
3.2.1.1	Adjusting Date and Time.....	12
3.2.1.2	Zeroing the Depth Sensor.....	12
3.2.2.1	Tabular Screen.....	13
3.2.2.2	Waveform Screen.....	14
3.2.3	DOM Blank Tab.....	16
3.2.3.1	Sample Filtrate.....	16
3.2.3.2	Procedure for Setting the DOM Blank Values.....	16
3.2.3.3	Loading Saved DOM Blank Files.....	17
3.2.4	Log Setup Tab.....	18
3.2.5.1	Methods for Saving Data Sets.....	21
3.2.5.2	Clearing the Datalog.....	21
4.0	<i>Maintenance and Warranty</i>	22
4.1	Maintenance.....	22
4.1.1	Rinsing.....	22
4.1.2	Care for the Bulkhead Connector.....	22
4.2	Warranty Terms.....	22
4.3	Warranty Service.....	22
4.4	Out-of-Warranty Service.....	23
Appendix A:	<i>Specifications</i>	25
Appendix B:	<i>Recommended Practices</i>	26
Appendix C:	<i>Wiring Guide</i>	27
	PhytoFind bulkhead and serial port connectors.....	27
Appendix D:	<i>Linear Range, Quenching and Temperature Considerations</i>	28
Appendix E:	<i>How to set up HyperTerminal for Digital (ASCII) Data Capture</i>	29

PhytoFind Algal Classification



WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE

Turner Designs is in the business of designing and selling products that benefit the well-being of our environment. Accordingly, we are concerned with preserving the surroundings wherever our instruments are used and happy to work with customers by complying with the WEEE Directive to reduce the environmental impact resulting from the use of our products.

WEEE Return Process:

To arrange the return of an end-of-life product, proceed as follows:

If you purchased your instrument through a Turner Designs Distributor please contact your local representative. They will instruct you where to return the end-of-life product.

If you purchased your instrument directly from Turner Designs please contact Turner Designs Customer Service

By Phone: 1-408-212-4041 or Toll Free: (877) 316.8049

By Email: Customer Service at support@turnerdesigns.com

Turner Designs will provide a WEEE RMA Number, a Shipping Account Number, and a Ship to Address. Package and ship the product back to Turner Designs.

The product will be dealt with per Turner Designs' end-of-life recycling program in an environmentally friendly way.

PhytoFind Algal Classification

1.0 Introduction

PhytoFind is an *in situ* Algal Classification tool that distinguishes among algal groups using specific fluorescence signatures. Three optical sensors with preset excitation and emission filters are used to determine the abundance of PE-containing algae (Cryptophytes), PC-containing algae (Cyanobacteria), and all other (Green-Brown) algal groups. A fourth sensor is used to automatically correct for interference from dissolved organic materials (DOM) providing increased accuracy in estimates. Optics are optimized for rejecting interference from suspended sediments.

PhytoFind is factory-calibrated (no calibration necessary) and comes with a factory-installed temperature probe and pressure sensor for depth measurements up to 600 meters. An optional integrated copper wiper and attachable copper plate are available to minimize biofouling for long-term deployments. Other accessories are available to aid with various sampling modes.

PhytoFind also comes with a simple Windows™ based graphical user interface (GUI) that allows users to view and capture data using real-time mode, configure the instrument for internal datalogging mode, and download data. Data reported include microgram per liter ($\mu\text{g/L}$) concentrations for each algal group detected and a total chlorophyll concentration as $\mu\text{g/L}$. Group abundances are also reported as a percent of the total algal population. Other reported parameters include temperature, depth, and relative fluorescence (RFU) of dissolved organics.

PhytoFind Algal Classification

2.0 Inspection

2.1 Instrument Checklist

The PhytoFind P/N 2380-001 package includes:

- ◆ PhytoFind Algal Classification Instrument
- ◆ Factory-installed temperature sensor
- ◆ Factory-installed depth sensor
- ◆ Continuous Data Cable P/N 2200-160 for communicating with your PC, supplying power to the instrument, and streaming data
- ◆ Communication and Integration Cable for USB Connections P/N 2300-115
- ◆ 8-pin female plug used when transporting, shipping, or storing PhytoFind
- ◆ 12-volt power supply with line cord P/N 7000-941

The PhytoFind P/N 2380-000 includes all of the above plus:

- ◆ Factory-installed Copper 3-Arm Mechanical Wiper P/N 2360-450



Copper 3-Arm Mechanical Wiper



Continuous Data Cable



8-pin female end plug

12V Power Supply



Communication and Integration Cable

PhytoFind Algal Classification

2.2 Optional Accessories

- ◆ Copper Wiper Arm Kit P/N 2360-459
- ◆ Replacement Brushes for Mechanical Wiper P/N 2200-460
- ◆ Replacement Spacers for Mechanical Wiper P/N 2360-462
- ◆ Antifouling Copper Plate P/N 2360-507
- ◆ Standard Rechargeable Submersible Battery Pack including charger P/N 2200-601
- ◆ Standard Battery Bracket P/N 2360-603 **Note: Required for use with Standard Battery Pack.**
- ◆ High Capacity Submersible Battery with Charger and Cable P/N 3200-600
- ◆ High Capacity Battery Bracket P/N 2360-605 **Note: Required for use with High Capacity Battery Pack.**
- ◆ Flow Cap P/N 2360-700
- ◆ Shade Cap P/N 2360-500 **Note: We recommend use of the shade cap as it minimizes potential effects from ambient light.**
- ◆ Shade Cap Weight P/N 2360-510
- ◆ Extender Cables:
 - ◆ 10 meters P/N 105-2595
 - ◆ 25 meters P/N 105-2596
 - ◆ 50 meters P/N 105-2597
 - ◆ Custom lengths available upon request
- ◆ Booster Kit P/N 2200-900 **Note: Required for cable lengths greater than 10 meters.**
- ◆ Solid Reference Standard Assembly P/N 2380-900. Includes the Solid Standard Cap and four Solid Standard Inserts P/N 2300-901 and 2300-902.

Battery Bracket



998-2385

Submersible Battery



Rev. D

High Capacity Submersible Battery with Charger and Cable



Page 6

PhytoFind Algal Classification

Shade Cap



Air Purge Slots

Solid Reference Standard Assembly



Solid Secondary Standards

Flow Cap



Copper Plate



Shade Cap Weight

Booster Kit



Extender Cable

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2.3 Identification

Sensors are marked with numbers located adjacent to the optics on the face of the PhytoFind. The table below indicates the light source color for all sensors installed. The PhytoFind's sensor positions must match the table below to function properly. If sensor positions do not match the table description, please contact Turner Designs immediately.

Light emitting diode color table:

Sensor Numbers	Light Source Color	Excitation Wavelength
1	Ultra Violet (No Color)	365 nm
2	No Sensor Installed	
3	RED	650 nm
4	BLUE	470 nm
5	No Sensor Installed	
6	GREEN	530 nm

PhytoFind Algal Classification

3.0 PhytoFind Windows™ User Interface

PhytoFind software is a simple, easy to use interface that allows users to communicate with PhytoFind to:

- Adjust settings
- View and record data in real-time
- Set up and enable datalogging mode
- Download Data

The instrument is factory-calibrated so no calibration functions are necessary or available.

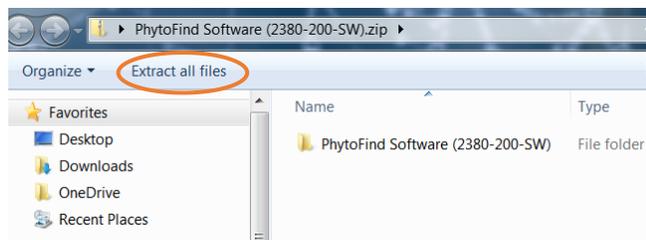
3.1 Software Installation and PC Requirements

3.1.1 Minimum PC Requirements

- ◆ 2 GHz microprocessor
- ◆ DirectX 10.0
- ◆ Microsoft Windows™ 7
- ◆ 1GB MB RAM

3.1.2 Software Installation

1. Exit all Windows™ programs.
2. Insert the *USB Flash Drive*. Software is also available for download on the Turner Designs webpage <https://www.turnerdesigns.com/phytofind-downloads>.
3. If installing from the flash drive, double-click the setup icon to begin software installation and proceed to Step 5.
4. If installing from the downloaded file you must first extract the files from the zip folder before proceeding. Once the files have been unzipped, double-click the setup icon to begin software installation.



5. The software will automatically be installed in the PC's C:/Program Files/Turner Designs/PhytoFind folder unless an alternate folder is designated during installation.
6. A "PhytoFind" icon shortcut will be added to the desktop. It is recommended that users restart the PC after installing PhytoFind software.

PhytoFind Algal Classification

3.1.3 Communication and Integration Cable

1. Insert the USB Flash Drive and install the Cable's driver - Integration-Interface_Adapter_Drivers.exe onto your PC.
2. Make sure nothing is plugged into the Cable's connectors.
3. Plug the USB connector into a USB port on your computer and wait for hardware to automatically install.
4. Once Cable is installed and ready to use, right click the My Computer Icon. **Note: For Windows 7 users, open the start menu and right click on Computer.**
5. Left click "properties" to open the properties window.
6. Left click "Device Manager". **Note: For Windows 7 users, the Device Manager link is located in the upper left part of the properties window.**
7. Open the "Ports" heading from the list.
8. The newly installed Adapter will be titled "USB Serial Port" followed by a COM port designation in parentheses - for example, "(COM 5)".
9. If the USB Serial Port's COM designation is labeled as any number from 1-50, your installation is complete.
10. If the USB Serial Port's COM designation is greater than 50, right click on the "USB Serial Port" and click "properties" which will open up the properties menu. From that menu click on the "Port Setting" tab and then click "Advanced" which will open the advanced settings menu for that USB Serial Port. Choose any COM port 1-50 from the COM port pull-down menu and click "OK". **Note: Ideally you want to start with any port that is not in use; if all are in use then choose any port 1-50.** Click "OK" to the warning box if it appears and Click "OK" to close any other open menus. Your installation is complete.

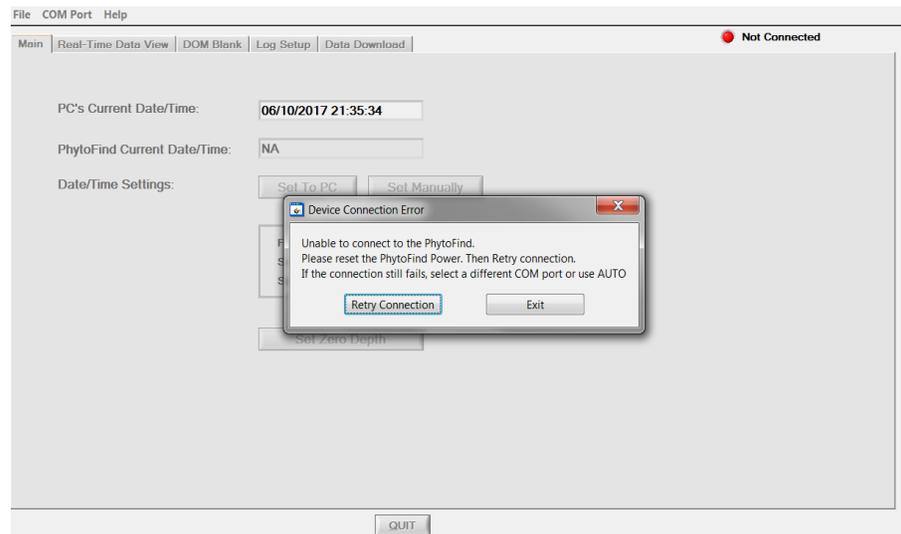
3.1.4 PC Software Interface

1. Plug either the USB or serial connector of the adapter cable into your computer.

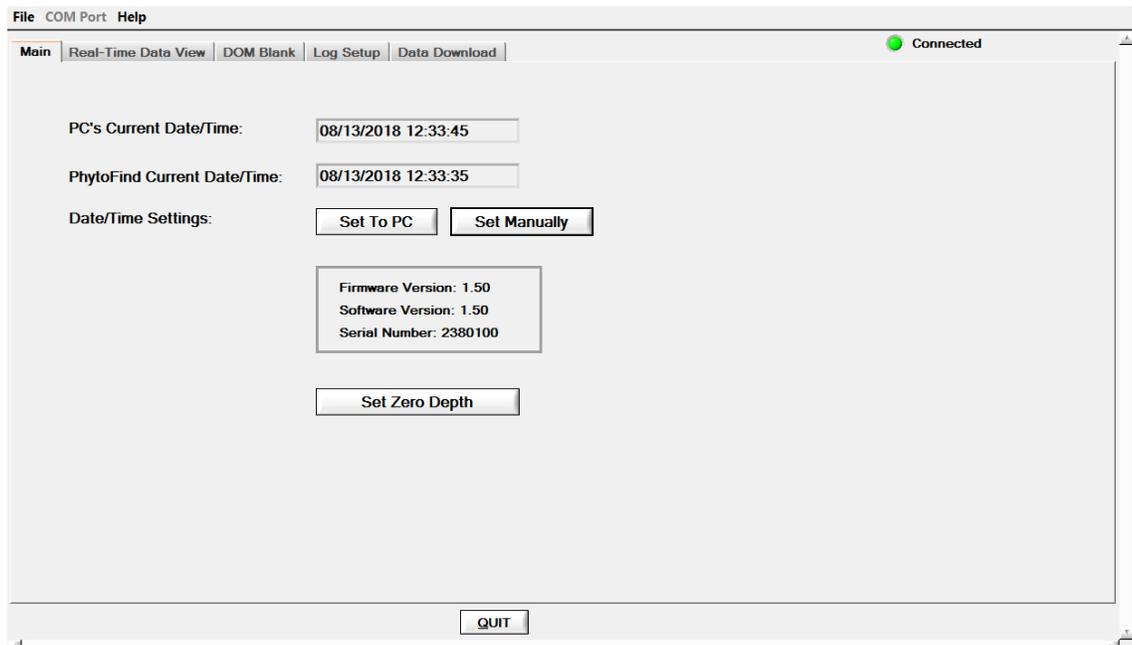
Note: Either connection can be used for communicating and configuring the instrument.
2. Plug the interface cable onto the 8-pin bulkhead connector of the instrument.
3. Plug the interface cable's serial plug into the adapter cable's male serial plug.
4. Plug the 12V power supply into a power source and use it to power the PhytoFind.

PhytoFind Algal Classification

5. Begin PhytoFind GUI by double-clicking on the software icon; COM port selection is set to automatically cycle through all COM ports looking for a connected and powered PhytoFind instrument.
6. If the connection process times out you may see the following window, cycle power and click the Retry Connection button.



7. When connected, the icon located in the upper right part of the screen will turn green and Connected will be displayed:



PhytoFind Algal Classification

3.2 Software Operation

3.2.1 Main Tab

The Main Tab allows users to set the date and time, view PhytoFind information, and zero the depth sensor.

NOTE: IT IS STRONGLY RECOMMENDED USERS SET TO PC TIME AND ZERO DEPTH IMMEDIATELY TO ADJUST TO LOCAL SETTINGS.

3.2.1.1 Adjusting Date and Time

It is highly recommended that users set the PhytoFind's date and time before proceeding through other PhytoFind settings or functions. There are two ways to adjust the date and time:

Set to PC

The PC's current date and time are automatically displayed in the Main Tab in the field titled "PC's Current Date/Time". Directly below that field the PhytoFind's current date and time are displayed. Clicking the "Set to PC" button will change "PhytoFind's Current Date/Time" to match the "PC's Current Date/Time". The setting can be verified by looking to see if the two fields, PC's and PhytoFind's Current Date/Time, match once the button is clicked.

Set Manually

When the Set Manually button is clicked a window will appear with an editable date/time field. The format in which the date and time are to be entered into that field is specified above that box. **Note: Only enter values in the format specified.** If the date or time have been edited, and the format is acceptable, a message in blue will be displayed indicating [Date and Time were edited](#) and you will be able to click the "Save Date/Time Now" button to change PhytoFind's current date and time to the date and time that was manually entered, and a message will be displayed indicating [PhytoFind Date/time was updated](#). Press the Quit button to exit to the main screen. **NOTE: If you Quit without saving, any changes that were made to date or time will not be implemented.**

3.2.1.2 Zeroing the Depth Sensor

The depth sensor will need to be zeroed to account for the atmospheric pressure for your region. To set the zero, click the "Set Zero Depth" button and a window will be displayed showing Current Pressure (PSI) value and below it Saved Pressure (PSI) value. The Current Pressure (PSI) value is what your current atmospheric pressure is as read by the PhytoFind's pressure sensor. The Saved Pressure (PSI) is the PSI that was saved when

PhytoFind Algal Classification

the pressure sensor was last zeroed. You can click the “Set Zero Depth” button located to the right of the Saved Pressure (PSI) value to save your PSI reading to be used as a new offset. Press the “Exit” button to exit the window. The PhytoFind uses the stored calibration and the offset value in an algorithm to convert from PSI to report depth in meters.

3.2.2 Real-Time Data View Tab

The Real-Time Data View tab allows users to view and/or capture real-time data acquisition, in both tabular and waveform formats.

NOTE: It is recommended users access the DOM Blank tab prior to viewing or capturing data using the Real-Time Data View Tab to ensure the DOM correction function is appropriately set. See section 3.3 for details.

- ◆ Parameter names are displayed and cannot be changed.
- ◆ Real-time values will continuously stream at 1 Hz (once per second).
- ◆ Real-time data can be saved by selecting the “Start Data Capture” button. Users will be prompted to enter a file name and file location. Data files will be saved as .csv format and can be accessed once “Stop Data Capture” has been selected

3.2.2.1 Tabular Screen

- ◆ Real-time data will continuously be scrolling on the tabular screen.
- ◆ The last 20 data points will be displayed; older data cannot be accessed if they haven't been captured using “Start Data Capture”
- ◆ Data displayed include: Date, Time, Algal Group Percent, Chlorophyll Concentration ($\mu\text{g/L}$) for each algal group, Total Chlorophyll Concentration ($\mu\text{g/L}$), Relative Fluorescence (RFU) for dissolved organic matter, Depth (meters), Temperature ($^{\circ}\text{C}$)
- ◆ Parameter names will be displayed in the associated column's header

PhytoFind Algal Classification

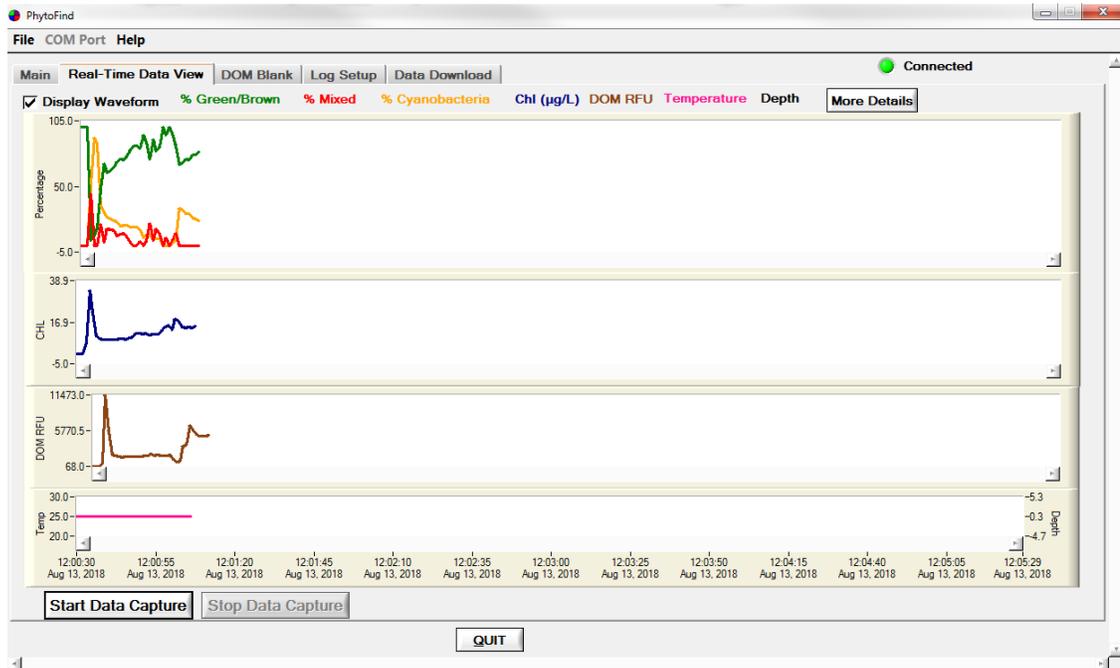
	Date/Time	% G/B	% Mix	% Cyano	G/B (µg/L)	Mix (µg/L)	Cyano (µg/L)	Total Chl (µg/L)	DOM RFU	Depth (m)	Temp (°C)
1	08/13/2018 11:57:21	100.00	0.00	0.00	0.02	0.00	0.00	0.02	32.00	0.3	24.79
2	08/13/2018 11:57:22	100.00	0.00	0.00	0.07	0.00	0.00	0.07	90.00	0.3	24.78
3	08/13/2018 11:57:23	100.00	0.00	0.00	0.02	0.00	0.00	0.02	54.00	0.3	24.78
4	08/13/2018 11:57:24	100.00	0.00	0.00	0.03	0.00	0.00	0.03	99.00	0.3	24.79
5	08/13/2018 11:57:25	100.00	0.00	0.00	0.03	0.00	0.00	0.03	48.00	0.3	24.79
6	08/13/2018 11:57:26	100.00	0.00	0.00	0.03	0.00	0.00	0.03	84.00	0.3	24.80
7	08/13/2018 11:57:27	0.00	95.90	4.10	0.00	1.17	0.05	1.22	31.00	0.3	24.79
8	08/13/2018 11:57:28	12.69	0.00	87.31	2.95	0.00	20.29	23.24	10981.00	0.3	24.80
9	08/13/2018 11:57:29	32.57	25.33	42.11	0.99	0.77	1.28	3.04	2786.00	0.3	24.80
10	08/13/2018 11:57:30	0.00	88.60	11.40	0.00	2.02	0.26	2.28	1279.00	0.3	24.80
11	08/13/2018 11:57:31	72.38	16.02	11.60	1.31	0.29	0.21	1.81	1228.00	0.3	24.80
12	08/13/2018 11:57:32	38.46	61.54	0.00	0.65	1.04	0.00	1.69	1138.00	0.3	24.80
13	08/13/2018 11:57:33	28.90	69.94	1.16	0.50	1.21	0.02	1.73	1128.00	0.3	24.81
14	08/13/2018 11:57:34	16.88	77.92	5.19	0.39	1.80	0.12	2.31	1311.00	0.3	24.81

3.2.2.2 Waveform Screen

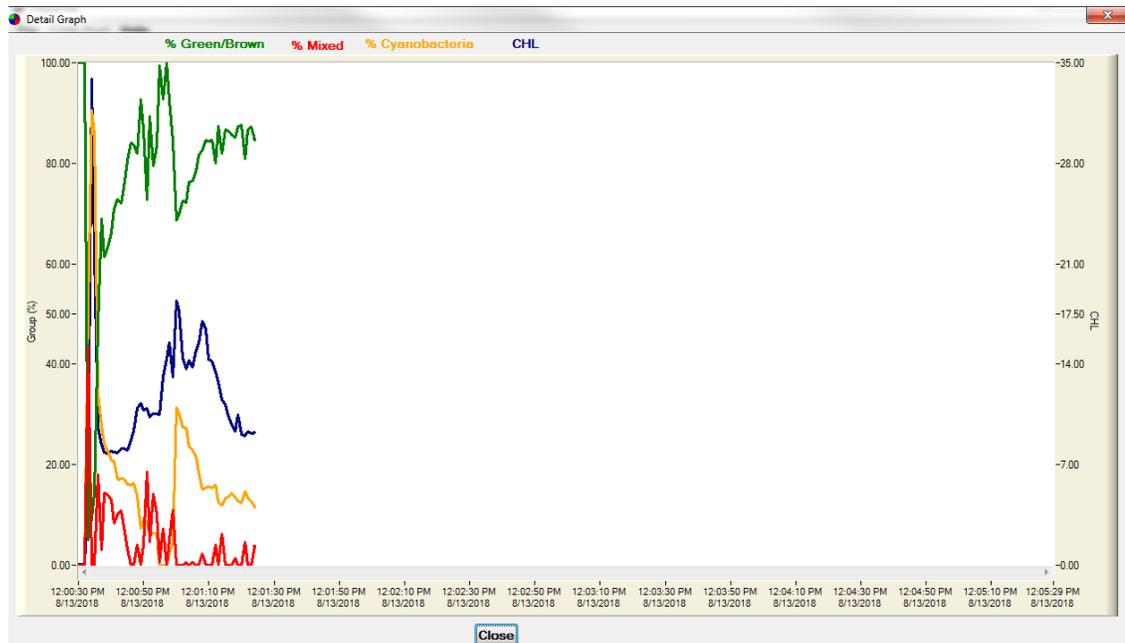
Users can graphically view real-time data by clicking the “Display Waveform” box.

- ◆ Parameter names and units will be displayed on the Y-axis; to the left of the screen; time and date will be displayed on the X-axis at the bottom of the screen
- ◆ Data can be saved during waveform mode by clicking “Start Data Capture”. Data files will be saved as .csv format.
- ◆ Waveform screen will display the last 5 minutes worth of data; older data cannot be accessed if they haven’t been captured using “Start Data Capture”
- ◆ Each parameter trace is associated with a color listed near the top of the screen. The graphs will autoscale; axes cannot be adjusted manually.

PhytoFind Algal Classification



- ◆ Clicking the “More Details” button will display a window showing only the following traces: %Green-Brown, %Mixed, %Cyanobacteria and Chl (µg/L). This function works similar to a zoom view allowing users to better resolve small changes in algal abundance and Chl estimates.



PhytoFind Algal Classification

3.2.3 DOM Blank Tab

Dissolved Organic Materials (DOM) may interfere with sensor response causing erroneous estimates when DOM concentrations are significantly high. PhytoFind can automatically correct for DOM interference to increase accuracy of estimates. To use this function users must measure DOM responses from a sample filtrate and save the responses to PhytoFind's memory. When this has been done, and the DOM correction is enabled by placing a check mark in the DOM correction checkbox, estimates will be automatically adjusted for changing DOM concentrations minimizing interference from DOM.

The DOM correction setting is saved based on the last Real-Time logging event. For example, if a check mark is placed in the DOM Correction box and then Start Data Capture is used to capture Real-Time data, the next time PhytoFind software is used to configure or setup PhytoFind for logging, DOM correction will automatically be enabled. To disable DOM correction, remove the checkmark from the DOM correction checkbox and start capturing data using the Real-Time Data View tab. This will save the disabling of the DOM correction setting. To again re-enable DOM correction, checkmark the DOM correction checkbox and start capturing data using the Real-Time Data View tab.

3.2.3.1 Sample Filtrate

To analyze the DOM concentration of your natural water, sample the source water (about 1 Liter) and run it through a 0.2 micron filter catching the filtrate in a clean container to be used for analysis by PhytoFind. See Appendix B for Recommended Practices on how to read samples in a beaker or plastic container. The PhytoFind's flow cap is recommended in place of beakers or plastic containers. If you have a PhytoFind flow cap, you can install the flow cap on the optical head of the PhytoFind and plug the side port with the plug provided, then pour the filtrate into the flow cap while holding the PhytoFind in a vertical position with optical end facing upward. Fill the flow cap with filtrate and cover the end of the flow cap with the flow cap's end cap. **Note: *Simply placing the end cap over the end of the flow cap is sufficient to eliminate the potential for ambient light to interfere with the readings.***

3.2.3.2 Procedure for Setting the DOM Blank Values

- 1) Connect the PhytoFind to your PC using the cables provided
- 2) Supply power to the instrument
- 3) Open PhytoFind software and wait for Connected to be displayed
- 4) Once connected, click the DOM Blank tab and place a checkmark in the DOM Correction box

PhytoFind Algal Classification

- 5) Click the Capture DOM Blanks button; a window will appear asking you to name the file
- 6) In the field available type in an identifier for the filtrate used (e.g. Lake-1) and click OK
- 7) The PhytoFind will now begin measuring the filtrate for 60 seconds; a counter is displayed indicating progress
 - a. At this time you can either wait for the measurement to complete or click Cancel to end the process. **Note: If you click cancel the sensor boxes will display zero; simply click Retrieve DOM Blanks from Device to populate those sensor boxes with the previously saved DOM value.**
- 8) When the measurement has completed, either:
 - a. A message box will be displayed indicating that the DOM in the filtrate is too low (< 1000 average RFU for the CDOM channel) and DOM correction is not required. **Note: DOM values will not be set or saved to file if DOM in filtrate is too low.**
 - b. A navigation window will be displayed in which case proceed to step 9.
- 9) Specify where you want to save the DOM Blanks file by navigating to a folder
- 10) Name the *file*. **Note: To avoid confusing file names, simply name the file what you previously named it using the identifier box in step 6, e.g. Lake-1.**
- 11) The file will appear as a .csv file in the folder you designated, however it is an encrypted file that can only be read by the PhytoFind.

NOTE: DO NOT CHANGE THE FILE IN ANY WAY; if the file is altered you will lose those DOM Blank values.

- 12) The DOM Blank values will be displayed in their appropriate fields in the DOM Blank tab.

3.2.3.3 Loading Saved DOM Blank Files

Users can save multiple DOM Blank files with different file names (identifiers) for each water type and load those filtrate values using the “Load Saved DOM Blanks” button also located in the DOM Blank tab. Simply click the button and navigate to the desired file, click on the file and click Load. The saved filtrate values will be displayed in their appropriate fields in the DOM Blank tab. This function allows users to deploy in different water types without

PhytoFind Algal Classification

having to re-run a filtrate to gather DOM Blank Values every time you change the PhytoFind's deployment location.

Note: To verify what DOM Blank values are stored in PhytoFind's memory, click the "Retrieve DOM Blanks from Device" button and the saved filtrate values will be displayed in their appropriate fields in the DOM Blank tab.

3.2.4 Log Setup Tab

The Log Setup screen allows the user to configure a logging session, set the mechanical wiper to its home position, and enable logging. The PhytoFind can log approximately 60,000 lines of data. A message highlighted in blue near the top of the screen will indicate how many data points can be logged to the available memory.

1. Enter a log start time (HH:MM:SS) and start date (MM/DD/YYYY).
2. Enter the sampling interval (HH:MM:SS). The minimum sampling interval is 1 second (e.g. 00:00:01).

Note: Invalid entries for Time, Date, and Interval will result in a message highlighted in Red indicating as such. Blue highlighted messages indicate valid entries have been made, therefore you can continue with log setup.



3. If the mechanical wiper is installed, the "Test Wiper" button will be active. Users may click the "Test Wiper" button to bring the wiper to the home position. After clicking Test Wiper, the wiper will rotate to home position and a message box will be displayed indicating the wiper test has passed for setting the home position. Click "OK".

Note: The wiper will rotate once per sample interval, before measurements are taken, if the sample interval is longer than 13 seconds.

PhytoFind Algal Classification

4. After log set up is complete select “Start Datalogging and Quit”, the PhytoFind’s sensors will flash 3x indicating that datalogging mode has been initiated. The software screen will automatically close and from that point on the PhytoFind will log at the set interval after a 45 second delay upon powering the instrument. If power is cycled (i.e. disconnected and reconnected) please allow 45 seconds for the data logging and streaming to begin.

Note: Check the optical face when power is supplied after cycling power to make sure the sensors light. The sensors will turn on, then off and then turn back on in 45 seconds. If this sequence does not happen, cycle power again.

The instrument is now in Datalogging Mode as well as Data Output Ready State and will remain in that state so long as PhytoFind software is not used to communicate with the instrument.

Note: As soon as PhytoFind software is used to communicate with the instrument, PhytoFind will stop data logging and output; Re-enable data output using steps above in section 3.2.4

Data will be output as ASCII data that can be captured with terminal programs or third party dataloggers.

Note: Use the [Battery Life Calculator](#) available on the Turner Designs website *PhytoFind* product page to calculate a conservative estimation of how many days you can expect to log data. Factors such as battery charge and water temperature will affect logging days. Low battery can result in intermittent logging.

3.2.5 Data Download Tab and File Management

Users can download data sets saved in the PhytoFind’s memory. There are multiple methods that help users organize downloaded data sets.

To download data:

- 1) Connect the PhytoFind to your PC using the cables provided.
- 2) Supply power to the instrument.
- 3) Open PhytoFind software and wait for connected to be displayed.
- 4) Click the Data Download tab. **Note: a message in blue near the top of the screen will indicate how many data sets and data points have been logged to memory.**

PhytoFind Algal Classification



- 5) Click the Download Data button and wait for data download to complete.
- 6) When data download has completed a download table will be displayed showing all downloaded data sets and measurements per set:

	Start Date & Time	End Date & Time	Measurements	Save	Last Saved...
1	Feb 09, 2018 08:51:00	Feb 09, 2018 08:51:00	1	✓	
2	Feb 09, 2018 08:53:00	Feb 09, 2018 08:53:00	1	✓	
3	Feb 09, 2018 11:13:00	Feb 09, 2018 11:16:00	4	✓	
4	Feb 09, 2018 11:20:00	Feb 09, 2018 11:20:00	1	✓	
5	Feb 13, 2018 12:01:00	Feb 13, 2018 12:02:00	2	✓	
6	Mar 09, 2018 13:22:00	Mar 09, 2018 13:29:00	8	✓	
7	Mar 09, 2018 13:31:00	Mar 09, 2018 13:34:00	4	✓	
8	Mar 09, 2018 13:52:00	Mar 09, 2018 14:03:00	12	✓	
9	Mar 14, 2018 09:25:00	Mar 14, 2018 09:28:00	4	✓	
10	Mar 14, 2018 13:04:00	Mar 14, 2018 13:04:00	1	✓	
11	Apr 04, 2018 10:08:00	Apr 04, 2018 10:17:00	19	✓	
12	Apr 16, 2018 15:55:00	Apr 16, 2018 15:56:00	3	✓	
13	Apr 16, 2018 16:05:50	Apr 16, 2018 16:10:20	28	✓	
14	Jul 11, 2018 21:37:30	Jul 11, 2018 21:44:40	44	✓	
15	Jul 11, 2018 21:47:10	Jul 11, 2018 21:47:10	1	✓	
16	Jul 11, 2018 21:48:20	Jul 11, 2018 21:48:20	1	✓	
17	Jul 11, 2018 22:05:45	Jul 11, 2018 22:05:45	1	✓	
18	Jul 11, 2018 22:16:45	Jul 12, 2018 10:49:15	3011	✓	
19	Jul 16, 2018 10:17:15	Jul 16, 2018 10:19:30	10	✓	
20	Jul 25, 2018 09:30:30	Jul 25, 2018 09:32:00	7	✓	
21	Jul 27, 2018 09:49:30	Jul 27, 2018 10:19:00	119	✓	
22	Aug 03, 2018 15:01:16	Aug 03, 2018 15:03:05	110	✓	

- 7) Users can click in the Save column to place a checkmark next to each data set they wish to save.
- 8) At the top of the screen there are multiple options for organizing data sets: Save as separate files, Save as one new file, Append to an existing file. Select one of the available save methods and click Save Files and the data sets will be saved as files according to the method chosen. **See section 3.2.5.1 for detailed explanation for each save method.**

Note: The field titled 'Last Saved...' in the download table will indicate the method used to save that data set; if the field is blank, then that data set was not saved.

PhytoFind Algal Classification

3.2.5.1 Methods for Saving Data Sets

Save as Separate File

This option allows users to save separate data sets as separate files. After choosing data sets to be saved a navigation window will be displayed. Navigate or create a folder to save the data sets in and enter a name in the filename field. That name will be used for each data set chosen with a numerical suffix added (e.g. Filename_1, Filename_2, Filename_3...) to create separate .csv files. Individual filenames can be changed by navigating to the file using windows navigator and renaming a file.

Save as One New File

This option allows users to save multiple data sets as one new file. After choosing data sets to be saved a navigation window will be displayed. Navigate or create a folder to save the data sets in and enter a name in the filename field. All the chosen data sets will be saved as one continuous .csv file. You can distinguish among sets within the file by looking at date/time to see the beginning and end of an individual data set.

Append to an Existing File

This option allows users to append data sets to an already existing file. After choosing data sets to be saved a navigation window will be displayed. Navigate to an already existing .csv file and select that file you wish to append data sets to. Click the Select button and the save designated data sets will be appended to the file selected. You can distinguish among sets within the file by looking at date/time to see the beginning and end of an individual data set.

3.2.5.2 Clearing the Datalog

When the Clear Datalog button (bottom right hand of the screen) is clicked a message box will be displayed asking if you are sure you want to erase all stored data. If Yes is clicked, all data from the PhytoFind will be erased.

NOTE: MAKE SURE ALL DATA SETS ARE SAVED BEFORE ERASING DATA FROM THE PHYTOFIND; IT IS IMPOSSIBLE TO RETRIEVE DATA ONCE IT HAS BEEN ERASED.

After data have been erased a message will display indicating that the PhytoFind does not have any stored data.

PhytoFind Algal Classification

4.0 Maintenance and Warranty

4.1 Maintenance

4.1.1 Rinsing

PhytoFind should be rinsed or soaked in freshwater following each deployment.

4.1.2 Care for the Bulkhead Connector

Install the 8-pin female end plug to the bulkhead between uses. A light coat of Silicone spray should be used on the rubber of the male pins of the bulkhead to aid in sealing. The manufacturer recommends 3M™ Silicone Lubricant Spray or Loctite 8021 spray. **Note: You should avoid using silicone grease. Do NOT use WD-40, it will destroy the connectors.**

4.2 Warranty Terms

Turner Designs warrants the PhytoFind and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from Turner Designs with the following restrictions:

- Turner Designs is not responsible for replacing parts damaged by accident or neglect. Your instrument must be installed according to instructions in the User's Manual. Damage from corrosion is not covered. Damage caused by customer modification of the instrument is not covered.
- This warranty covers only Turner Designs products and is not extended to equipment used with our products. We are not responsible for incidental or consequential damages, except in those states where this limitation is not allowed. This warranty gives you specific legal rights and you may have other rights which vary from state to state.
- Damage incurred in shipping is not covered.

4.3 Warranty Service

To obtain service during the warranty period, the owner shall take the following steps:

1. Write, email or call the Turner Designs Technical Support department and describe as precisely as possible the nature of the problem.

Phone: 1 (877) 316-8049

Email: support@turnerdesigns.com

PhytoFind Algal Classification

2. Carry out any adjustments or tests as suggested by the Technical Support Department.
3. If proper performance is not obtained you will be issued a Return Materials Authorization number (RMA) to reference. Package the unit, write the RMA number on the outside of the shipping carton, and ship the instrument, prepaid, to Turner Designs. If the failure is covered under the warranty terms, the instrument will be repaired and returned free of charge, for all customers in the contiguous continental United States.

For customers outside of the contiguous continental United States who purchased equipment from one of our authorized distributors, contact the distributor. If you purchased directly, contact us. We will repair the instrument at no charge. Customer pays for shipping, duties and documentation to Turner Designs. Turner Designs pays for return shipment (custom duties, taxes and fees are the responsibility of the customer).

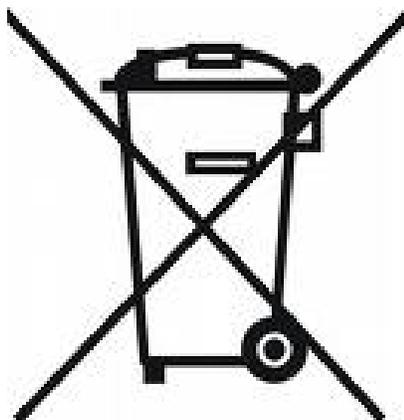
4.4 Out-of-Warranty Service

Follow steps for Warranty Service as listed above. If our Technical Support department can assist you by phone or correspondence, we will be glad to, at no charge. Repair service will be billed on a fixed price basis, plus any applicable duties and/or taxes. Shipment to Turner Designs should be prepaid. Your bill will include return shipment freight charges.

Address for Shipment:

Turner Designs, Inc.
1995 N. 1st Street
San Jose, CA 95112

PhytoFind Algal Classification



WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE

Turner Designs is in the business of designing and selling products that benefit the well-being of our environment. Accordingly, we are concerned with preserving the surroundings wherever our instruments are used and happy to work with customers by complying with the WEEE Directive to reduce the environmental impact resulting from the use of our products.

WEEE Return Process:

To arrange the return of an end-of-life product, proceed as follows:

If you purchased your instrument through a Turner Designs Distributor please contact your local representative. They will instruct you where to return the end-of-life product.

If you purchased your instrument directly from Turner Designs please contact Turner Designs Customer Service

By Phone: 1-408-212-4041 or Toll Free: (877) 316.8049

By Email: Customer Service at support@turnerdesigns.com

Turner Designs will provide a WEEE RMA Number, a Shipping Account Number, and a Ship to Address. Package and ship the product back to Turner Designs.

The product will be dealt with per Turner Designs' end-of-life recycling program in an environmentally friendly way.

PhytoFind Algal Classification

Appendix A: Specifications

PhytoFind	
Weight in Air	2.87 kg (6.33 lbs)
Length	27.43 cm (10.8 in.)
Diameter	13.84 cm (5.25 in.)
Material	Delrin
Operating Temperature	-2 to 50 °C
Temperature Accuracy	0.5 °C
Temperature Resolution	0.1°C
Depth	0-600 meters
DC Power Required	8 to 30 volts; 2.2 amperes
Maximum Current Draw at 12 volts	Operational = 300 mA
	Sleep = 3 mA
Minimum Sampling Interval	1 second
Signal Output	Digital (ASCII)
Interface	RS232 (USB Adapter)
Nonvolatile Memory	Approximately 60,000 Data Lines
Minimum Detection Limit	0.5 µg/L chlorophyll
Max Range	0-250 µg/L chlorophyll
Sensor Light Source	Light Emitting Diode (LED)
Detector	Photodiode

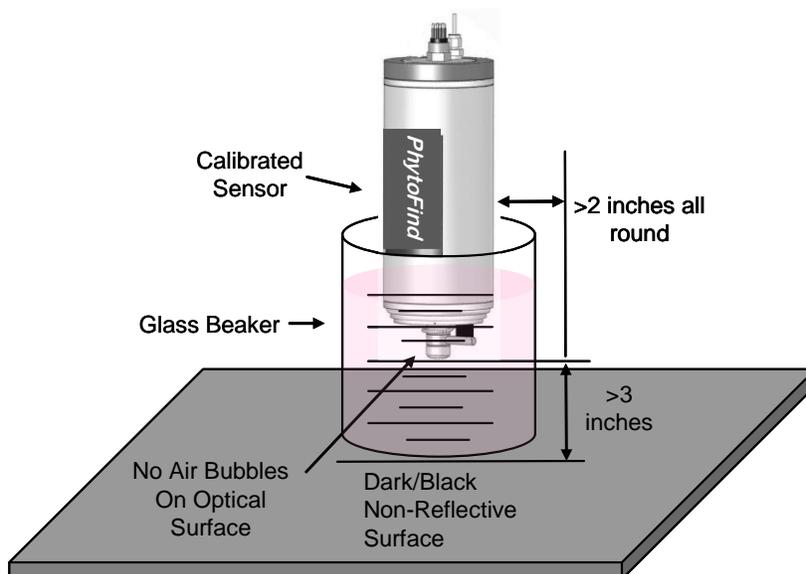
PhytoFind Algal Classification

Appendix B: Recommended Practices

The following steps will improve the accuracy and repeatability of your measurements, especially at low concentration levels:

1. Use a dark plastic or glass container for your samples.
Note: Some plastics may fluoresce and might interfere with measurements.
2. If using a glass beaker, place it on a non-reflective surface, preferably black.
3. Ensure that the sensor is **>3 inches above the bottom** of the container.
4. Ensure that the sensor is in the center of the container and has **>2 inches clearance** between the sensor and the inside surface of the container.
5. If using a glass beaker, check if the optical surface of the sensor is free of air bubbles. Remove air bubbles if any are observed. If using a dark plastic container, run the wiper or your finger over the optical sensors to ensure the sensor heads are free of air bubbles.

We recommend use of the shade cap as it provides a fixed distance for calibration and sample measurement and minimizes effects from ambient light.



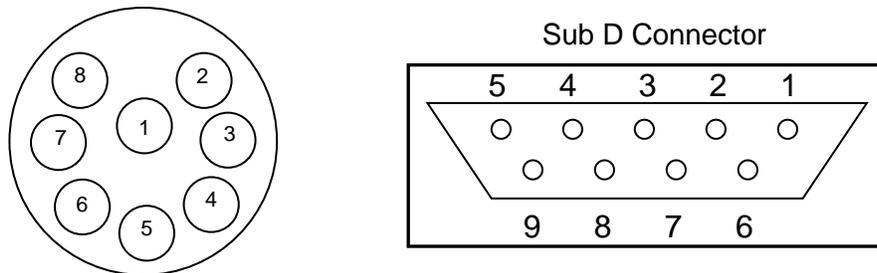
PhytoFind Algal Classification

Appendix C: Wiring Guide

The PhytoFind outputs digital data in two formats: 1) Digital data that can only be read by PhytoFind software and 2) Digital data in ASCII format that can be read by larger multi parameter systems such as CTDs or third party dataloggers.

An 8-pin Impulse cable provides two end connections: 1) a 9-pin RS232 serial port for connection to a PC or laptop computer and 2) a 12V port for supplying power to the unit.

PhytoFind bulkhead and serial port connectors



Wire Guide

Pin Out	Color	C3 Function	Corresponding Sub D Connector Pin
1	Black	V BATT (+)	Power Connector Cable – Center Pin (+)
2	White	V BATT (-)	Power Connector Cable – Housing (-)
3	Red	GND	PIN 5
4	Green	RX	PIN 2
5	Blue	TX	PIN 3
6	Brown	DTR & DSR	PIN 4, 6
7	Yellow	RTS & CTS	PIN 7, 8
8	Orange	N/A	N/A

**Power ground and V Batt (-) are not common.*

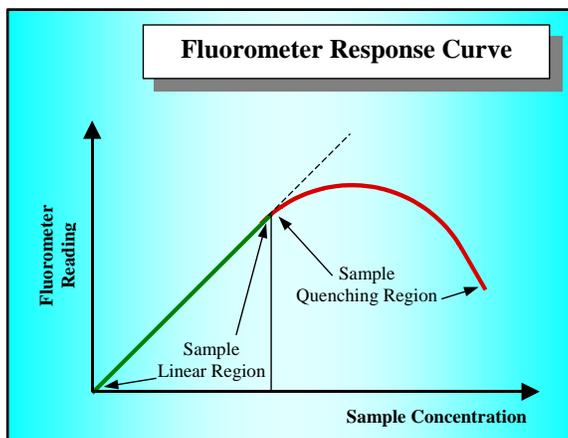
PhytoFind Algal Classification

Appendix D: Linear Range, Quenching and Temperature Considerations

The linear range is the concentration range in which the PhytoFind output is directly proportional to the concentration of the signal. The linear range begins with the smallest detectable concentration and spans to an upper limit (concentration) that is dependent upon the properties of the material, filters used, and path length.

A non-linear relationship is seen at very high concentrations where the signal does not increase at a constant rate in comparison to the change in concentration (see figure below). At even higher concentrations, the signal will decrease even though the sample concentrations are continuing to increase. This effect is known as “signal quenching”.

Linearity can be checked by diluting a sample 1:1 or some other convenient ratio. If the sample is still in the linear range, the reading will decrease in direct proportion to the dilution. If the reading does not decrease in direct proportion to the dilution or if the reading increases, the sample is beyond the linear range.



Graph showing Linear and Quenching Regions of the sample's response

PhytoFind Algal Classification

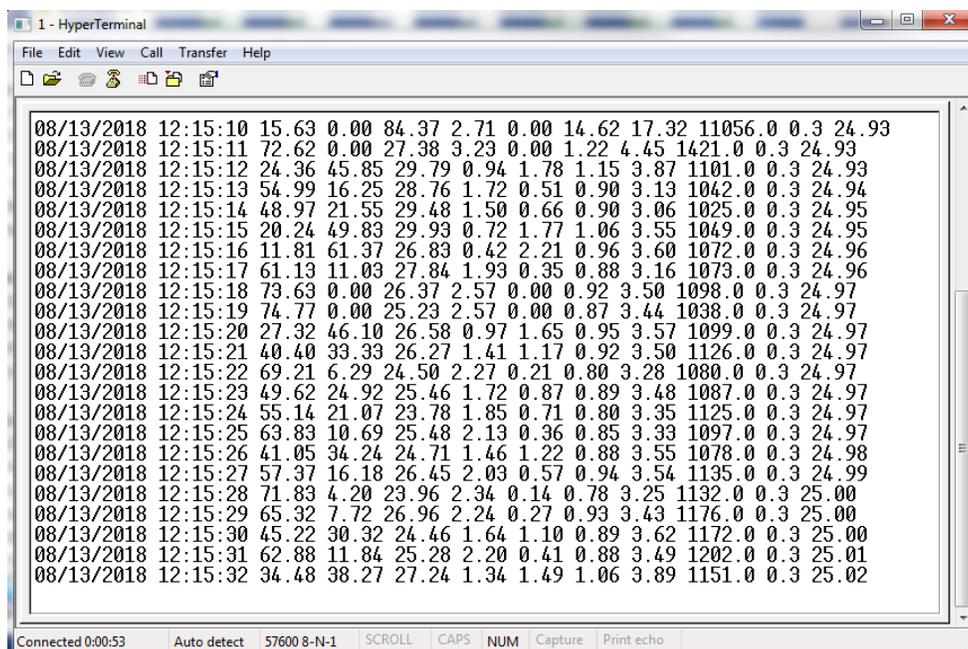
Appendix E: How to set up HyperTerminal for Digital (ASCII) Data Capture

1. Ensure PhytoFind program is not running in the background. On an MS Windows computer, open the HyperTerminal program
Start→All Programs→Accessories→Communications→ HyperTerminal
2. The **Connection Description** screen will appear. Name the connection description. This file will save the communication parameters for the Submersible Fluorometer and can be used in the future to establish communication with the instrument quickly.
3. The **Connect To** screen will appear. Choose the appropriate communications port in the **Connect Using** window. Click **OK**.
4. The **Port Settings** screen will appear. Choose the following port settings:

Bits per second: 57600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: Hardware

Click **Apply** and **OK**

5. Next, the **HyperTerminal** window will appear. You are now ready to connect the Submersible Fluorometer to a power source. Data will be displayed at set intervals in the HyperTerminal window after 60 seconds or at the specified log start time.



PhytoFind Algal Classification

Most applications will integrate streaming data. Below are instructions on how to save streaming data on a PC.

To save data:

1. On the HyperTerminal window toolbar, choose Transfer and then Capture Text.



2. When you click on Capture Text, a window will appear asking you to **name** and **save** the **.txt** file to the location of interest.



3. Once you are finished, you will need to return to the HyperTerminal window toolbar, choose **Transfer** and then **Capture Text** and select **Stop**. This will stop data capture to the **.txt** file.

